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<p><b>(21) International Application Number:</b> PCT/GB97/03186</p> <p><b>(22) International Filing Date:</b> 20 November 1997 (20.11.97)</p> <p><b>(30) Priority Data:</b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">9626153.2</td> <td style="width: 40%;">17 December 1996 (17.12.96)</td> <td style="width: 30%;">GB</td> </tr> <tr> <td>9713595.8</td> <td>28 June 1997 (28.06.97)</td> <td>GB</td> </tr> </table> <p><b>(71) Applicant (for all designated States except US):</b> SCAPA GROUP PLC [GB/GB]; Oakfield House, 98 Preston New Road, Blackburn BB2 6AY (GB).</p> <p><b>(72) Inventors; and</b></p> <p><b>(75) Inventors/Applicants (for US only):</b> WHITTAKER, Ian, Alistair [GB/GB]; 12 Tandle Hill Road, Royton, Oldham OL2 5UU (GB). MARKS, Colin [GB/GB]; 37 Moorgate Street, Blackburn BB2 4PB (GB).</p> <p><b>(74) Agents:</b> GOODWIN, Mark et al.; Wilson Gunn M'Caw, 41-51 Royal Exchange, Cross Street, Manchester M2 7BD (GB).</p>		9626153.2	17 December 1996 (17.12.96)	GB	9713595.8	28 June 1997 (28.06.97)	GB	<p><b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b>  <i>With international search report.</i></p>
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<p><b>(54) Title:</b> PAPERMAKERS FELTS</p>								
<p><b>(57) Abstract</b></p> <p>A method of making a paper-makers felt comprises the steps of directing ultrasonic energy onto the batt of fibres so as to at least partially melt the fibres provided on a surface of the fabric. A pattern is then imprinted into the batt whilst the fibres are in a molten state.</p>								

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### PAPERMAKERS FELTS

The present invention relates to papermakers felts and more particularly to a method for making embossed papermakers felts.

The use of press felts during the manufacturing process for making paper is well documented. Standard press felts generally have an essentially smooth surface so as not to mark the paper web supported on the felt during the pressing operation. Some types of papermakers felts, however, are provided either with an embossed pattern on the felt surface, or with harder yarns strategically placed just below the fibrous face layer. Marking felts, for example, are used to produce paper which requires a distinctive pattern embossed thereon. Press felts for use in the press section of a pulp dryer machine may also be provided with an embossed surface so as to improve the drying efficiency. A further use of such embossed papermakers felts is in the web pick-up arrangement of a Yankee machine which transfers the formed web to a press felt.

WO 96/25555 relates to a method of making a papermakers forming fabric or a papermakers dryer fabric having a patterned resin surface with openings through which air and/or water is conveyed during paper formation and drying of the paper. This process is time consuming and expensive.

In particular this felt is used as a pick-up felt in a Yankee cylinder dryer process, marking press felt, press felt for dewatering pulp or as a deflection fabric or through air dryer (TAD) fabric for forming a tissue web.

The present invention seeks to provide a simple and relatively less costly method of making an embossing papermakers felt.

According to a first aspect of the present invention there is provided a method

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of making a papermakers fabric comprising a batt of fibres, the fabric having an embossed surface, said method comprising the steps of directing ultrasonic energy onto the batt of fibres so as to at least partially melt the fibres provided on a surface of the fabric, said method further comprising the step of imprinting a pattern into the batt of fibres whilst the fibres are in a molten state.

According to a second aspect of the present invention there is provided a method of providing an embossed fibrous batt for use in a papermakers fabric, said method comprising the steps of directing ultrasonic energy onto the batt of fibres so as to at least partially melt the fibres which are to be provided on a surface of the papermakers fabric, said method further comprising the step of imprinting a pattern into the batt of fibres whilst the fibres are in a molten state.

Either of these methods is quick and simple to use. It is also inexpensive and can be achieved using simple equipment.

The ultrasonic tool may, in use, melt not only some of the batt fibres, but also at least some of the base cloth yarns, at least in part. The imprinting may be achieved by way of an engraving wheel or roller. The imprinting step may take place immediately after or more preferably simultaneously with directing the ultrasonic energy at the fibres.

The felt may be foraminous so as to make it suitable as a forming belt for tissue. This could be done by using the ultrasonic tool to make small perforations in the embossed area, or by laser cutting.

It is noted that this technology is useful not only in providing an embossed fibrous batt, but also in densifying a batt of fibres which need not necessarily be embossed.

The densifying or pre-compaction of batts of fibrous material is generally carried out by needle punching. However, the use of needle punching for pre-compaction is restricted in that high felt densities can not be achieved without damaging the felt fibres.

This aspect of the present invention has been made from a consideration of this problem.

According to a further aspect of the present invention there is provided a method of compacting a batt of fibres, said method comprising the steps of directing ultrasonic energy onto the said batt so as to at least partially melt the fibres of the batt, said method further comprising compacting the said fibres of the batt while the fibres of the batt are in a molten state.

Preferably the compacting step takes place as ultrasonic energy is simultaneously directed onto the said batt.

The method of the invention reduces the felt thickness and void volume of the batt as well as yielding a more smooth batt surface. This results in quicker felt start-up on the paper machine, particularly if the paper side of the felt is pre-compacted. Start-up involves ensuring that the felt is wetted out and its surface smoothened, at which point it is ready to process the paper web.

The ultrasonic pre-compaction method of the invention takes place at the finishing stage of felt making, ideally at the same time as heat-setting of the felt.

Preferably the felt is not embossed during pre-compaction, with a smooth surface compactor such as a roll being used. For pre-compacting pulp dryer felts or marking felts the compactor ideally has circumferential grooves to leave a corresponding embossed pattern in the pulp or paper side of the felt.

In order that the present invention may be more readily understood specific embodiments thereof will now be described by way of example only with reference to the accompanying drawings in which:-

Fig.1 is a diagrammatic illustration of one apparatus for use in the process of the invention; and

Fig. 2 is a diagrammatic illustration of a second apparatus for use in the process of the invention.

In the drawings similar reference numerals are used to represent like parts.

Referring to fig.1 an endless press felt 10 comprising a plurality of batts of fibres needled onto a base cloth is located over four rollers 11. The felt 10 is fed over a series of sonic horns 12 which bear against the papermakers felt. An anvil 13 is provided in register with the series of horns 12, but on the opposite side of the press felt. Neither the horns 12 nor the press felt is heated. Heat is generated with the material itself by the absorption of energy from the ultrasonic horn 12. The ultrasonic horn 12 melts the fibrous batt surface of the fabric 10. The fabric 10 subsequently passes through the nip between press rollers 14,15. One of the press rollers 14 has an engraving surface. This acts to imprint a pattern in the fused fibrous material. This subsequently solidifies to form a 3D embossed pattern in the batt that resists degradation resulting from repeated passages through a press nip.

Fig.2 shows an arrangement similar to that illustrated in fig.1 except in that the embossing step takes place at the same time as the ultrasonic welding step. Here the embossing wheel acts as an anvil and there is no need to provide a static anvil as illustrated in fig.1.

It is to be understood that the above described embodiments of the invention

are made by way of illustration only. Many modifications and variations are possible.

For example, one or more batts of fibre rather than the papermakers fabric per se, which includes a base cloth, may be passed through the apparatus as illustrated in figs. 1 and 2. Furthermore the apparatus of figs. 1 and 2 may be used to simply compact one or more batts of fibres by directing ultrasonic energy onto the batt so as to at least partially melt the fibres of the batt, the method further comprising compacting the said fibres of the batt while the fibres of the batt are in a molten state.

**CLAIMS**

1. A method of making a papermakers fabric comprising a batt of fibres, the fabric having an embossed surface, said method comprising the steps of directing ultrasonic energy onto the batt of fibres so as to at least partially melt the fibres provided on a surface of the fabric, said method further comprising the step of imprinting a pattern into the batt of fibres whilst the fibres are in a molten state.
2. A method of making a papermakers fabric as claimed in claim 1, wherein the batt is secured to a base fabric and at least some of the base fabric is melted by the ultrasonic energy.
3. A method of making a papermakers fabric as claimed in claim 1 or claims 2, wherein the imprinting is achieved by way of an engraving wheel or roller.
4. A method of making a papermakers fabric as claimed in any preceding claim, wherein imprinting takes place immediately after the step of directing the ultrasonic energy onto the batt.
5. A method of making a papermakers fabric as claimed in any preceding claim, wherein imprinting takes place simultaneously with the step of directing the ultrasonic energy onto the batt.
6. A method of making a papermakers fabric as claimed in any preceding claim, wherein the method further comprises the step of making the batt foraminous.
7. A method of making a papermakers fabric as claimed in claim 6, wherein the batt is made foraminous by using the tool for directing the ultrasonic energy to make small perforations in the batt.
8. A method of making a papermakers fabric as claimed in claim 6, wherein the batt is made foraminous by laser cutting.

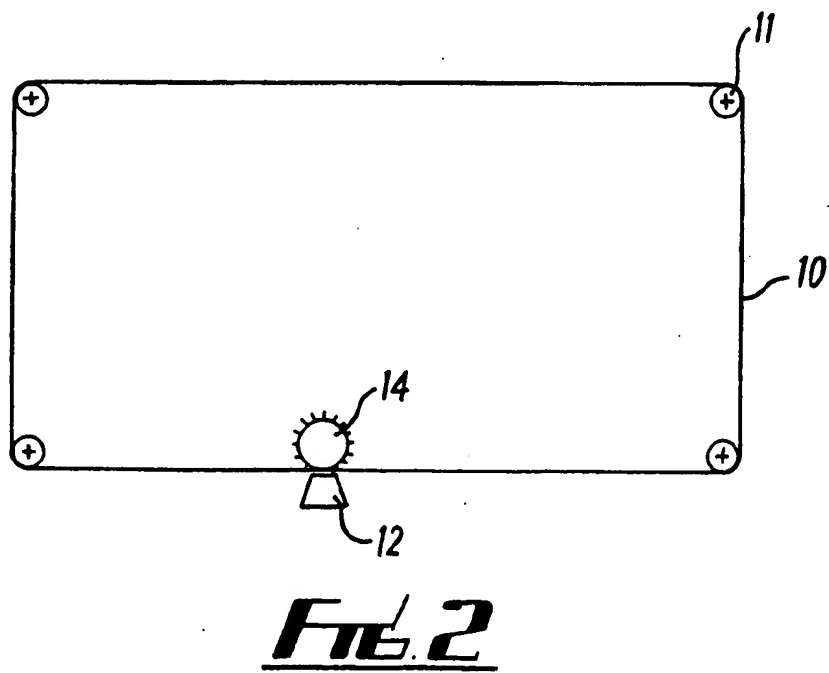
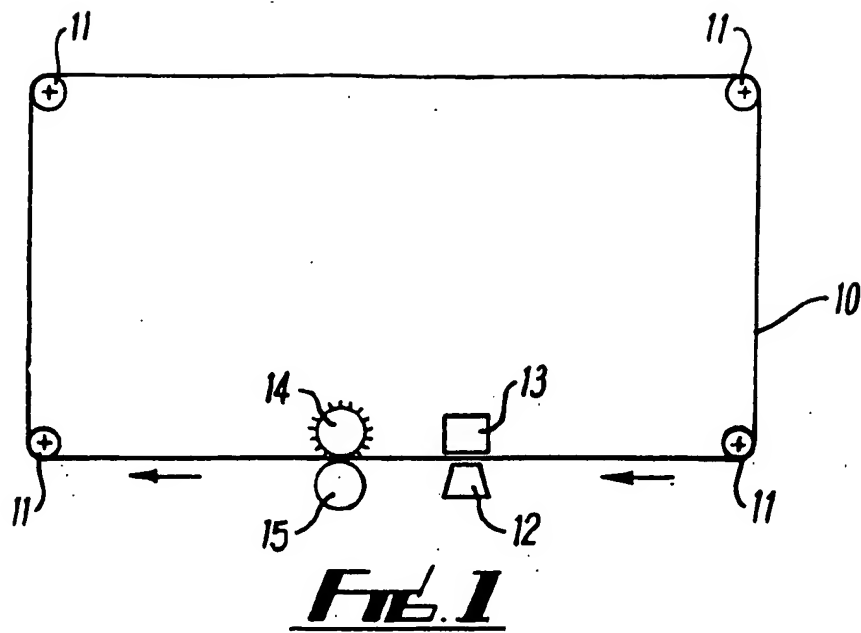


9. A method of providing an embossed fibrous batt for use in a papermakers fabric, said method comprising the steps of directing ultrasonic energy onto the batt of fibres so as to at least partially melt the fibres which are to be provided on a surface of the papermakers fabric, said method further comprising the step of imprinting a pattern into the batt of fibres whilst the fibres are in a molten state.
10. A method of making a papermakers fabric as claimed in claim 9, wherein the imprinting is achieved by way of an engraving wheel or roller.
11. A method of making a papermakers fabric as claimed in claim 9 or claim 10, wherein imprinting takes place immediately after the step of directing the ultrasonic energy onto the batt.
12. A method of making a papermakers fabric as claimed in any of claims 9 to 11, wherein imprinting takes place simultaneously with the step of directing the ultrasonic energy onto the batt.
13. A method of making a papermakers fabric as claimed in any of claims 9 to 12, wherein the method further comprises the step of making the batt foraminous.
14. A method of making a papermakers fabric as claimed in claim 13, wherein the batt is made foraminous by using the tool for directing the ultrasonic energy to make small perforations in the batt.
15. A method of making a papermakers fabric as claimed in claim 13, wherein the batt is made foraminous by laser cutting.
16. A method of compacting a batt of fibres, said method comprising the steps of directing ultrasonic energy onto the said batt so as to at least partially melt the fibres of the batt, said method further comprising compacting the said fibres of the batt while the fibres of the batt are in a molten state.

17. A method of compacting a batt of fibres as claimed in claim 16, wherein the said step of compacting the fibres takes place while the ultrasonic energy is directed onto the said batt.

18. A method of compacting a batt as claimed in claim 16 or claim 17, wherein the method takes place during heat-setting of a felt.

19. A method of compacting a batt as claimed in claim 18, wherein the felt is embossed during the compacting step.



# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/GB 97/03186

**A. CLASSIFICATION OF SUBJECT MATTER**  
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According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 394 134 A (GASCOGNE PAPETERIES ; DECHAMPS A & FILS ETS (FR); FEUTRE DEPLAND (F) 24 October 1990 see the whole document ---	1-3, 5, 9, 10, 12, 16-19
Y	PATENT ABSTRACTS OF JAPAN vol. 096, no. 010, 31 October 1996 & JP 08 158286 A (DAIWABO CO LTD), 18 June 1996, see abstract ---	1-3, 5, 9, 10, 12, 16-19
A	US 4 879 155 A (FUJISAWA MITSUO) 7 November 1989 see abstract ---	1
A	US 4 902 366 A (BADER HANS) 20 February 1990 see the whole document -----	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Information on patent family members

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